

HOLOGRAM RECORDING MATERIAL COMPOSITION
AND HOLOGRAM RECORDING MEDIUM

FIELD OF THE INVENTION

The present invention relates to a novel hologram recording material composition, and particularly a hologram recording material composition that can be easily formed into a film on production of a hologram recording medium and enables a recording medium being excellent in diffraction efficiency, which is one of fundamental characteristics required for a hologram, to be produced, and it also relates to the hologram recording medium obtained therefrom.

BACKGROUND OF THE INVENTION

A hologram is a record of an interference pattern of coherent laser light on a photosensitive material, and is used in various field, such as an optical device, a three-dimensional display, interferometry and processing of an image and information, owing to the multi-functionality thereof.

As a representative example of the conventional hologram recording material composition, a gelatin dichromate photosensitive material and a breached silver salt photosensitive material (described, for example, in Display Holography Handbook, p. 66 to 67 (Gyoin Shokan, 1985) and Optical Engineering Handbook, p. 351 to 353 (Asakura Shoten, 1986)).

However, although gelatin dichromate has a high diffraction efficiency, and a silver salt photosensitive material has a high sensitivity, these materials require a complicated process on production of a hologram,

and particularly they have a problem in that they require a wet development process.

As a photosensitive material to eliminate the problem, a hologram recording material composition containing a photo-polymerizable monomer is proposed. In this material, a photo-polymerizable monomer is polymerized in a portion having a large light amount in the interference pattern to cause a refractive index modulation in that portion, and thus a hologram is recorded. Examples thereof include a photo-polymerization type recording material mainly comprising cyclohexyl methacrylate and N-vinylcarbazole as photopolymerizable monomers; and a photo-polymerization initiator, and a photo-polymerization type recording material mainly comprising butyl methacrylate and ethylene glycol dimethacrylate as photopolymerizable monomers, and 1-phenylnaphthalene as an inert component not participating in the polymerization; and a photo-polymerization initiator (as described in Appl. Opt., vol. 15, p. 534 (1976)). However, because these materials are in a liquid state, the composition flows between two surface materials on recording a hologram to prevent recording in good conditions. Furthermore, a unreacted monomer remains after recording the hologram in a portion of a small light amount, and therefore the record is necessarily stabilized by conducting an exposure treatment on the whole surface.

JP-A-3-36582 and JP-A-3-249685 disclose a hologram recording material composition mainly comprising an allyl monomer and an acryl monomer that have different polymerization reactivities and different refractive indices of resulting polymers. Upon using the composition, a

heat treatment is conducted after filling the composition between two surface materials to suppress the flowability of the composition, and thus the problems are to be solved.

However, the hologram recording material composition requires a heat treatment to be fixed between the two surface materials, and has a problem in that the process of film formation becomes complicated.

SUMMARY OF THE INVENTION

An object of the invention is to provide a hologram recording material composition that can eliminate the problems associated with the conventional products, i.e., the complicated process of film formation, with exhibiting the excellent performance, such as transparency, diffraction efficiency and resolution, equivalent to the conventional products.

As a result of earnest investigations to attain the object described above by the inventors, a novel hologram recording material composition has been developed to complete the invention.

The invention relates to a hologram recording material composition comprising (A) an allyl-based prepolymer being soluble in a non-aqueous solvent and having at least one allyl group in a molecule thereof and a molecular weight of 10,000 to 100,000, (B) a (meth)acrylate-based compound having at least one polymerizable unsaturated group in a molecule thereof, and (C) a photo-polymerization initiator, wherein a difference between a refractive index of said allyl-based prepolymer (A) and a refractive index of a polymer of said (meth)acrylate compound (B) is 0.005 or more (preferably 0.01 or more).